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# ► Reading John Muir's Life

an evaluation of the Scottish Book Trust's graphic novel project

Prepared for **the Scottish Book Trust**

by

**Alette Willis, PhD**

**Franziska Schmidt, MSc**

The School of Health in Social Science

University of Edinburgh

Edinburgh, United Kingdom, EH8 9AG

[a.willis@ed.ac.uk](mailto:a.willis@ed.ac.uk)

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THE UNIVERSITY  
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# Chapter 1: Introduction

## 1.1. Background to the Book

Although pioneering conservationist John Muir is well known in the United States of America, where he spent most of his life and had the greatest influence on conservation, until recently he has been relatively uncelebrated in his country of birth, Scotland. From 2013 to 2014 the Scottish Book Trust (SBT) developed a graphic novel for children aged 11 to 15, which depicts the life of John Muir. This graphic novel was launched at the opening of a new long-distance walking route, The John Muir Way, which links Dunbar on the east coast, where Muir was born, to the harbour in Helensburgh on the west coast where he departed Scotland. SBT graphic novel John Muir: Earth - Planet - Universe aims to raise awareness of John Muir, who is often referred to as the Father of National Parks, and to instil and reinforce an interest in the natural world and its protection amongst secondary school pupils across Scotland.

SBT is a non-governmental organisation which promotes literature, reading and writing in Scotland. SBT has recently begun to produce and publish graphic novels through a creative process of bringing readers, authors and illustrators together around a subject of interest. The intention behind working this way is to create works that are directly relevant to the readers they are aimed at and to gain buy-in at conception from the organisations who will work with the book.

John Muir: Earth - Planet - Universe was the second book to be produced in this way. Sixteen thousand copies of the book were distributed in the spring of 2014, with each secondary schools in Scotland receiving a classroom set. Additional books were distributed as part of the opening of the John Muir Way and to delegates of the John Muir conference in Perth on 13<sup>th</sup> May 2014. The research outlined in this paper was conducted independently of SBT by staff of the University of Edinburgh from May 2014 through January 2015. The aim of this research was to look for evidence to determine whether SBT's objectives for this project had been met.

## 1.2. Details of production of book

The methods for producing John Muir: Earth - Planet - Universe, were first used in the production of the graphic novel Skint in 2011. Staff of SBT, writer Julie Bertagna and illustrator William Goldsmith worked with 8 schools in the Central Belt of Scotland and East Lothian in 3 workshops each to develop the graphic novel. Classes at these schools were first approached with information about John Muir's life and were asked to provide

feedback about what episodes were most interesting. The author and illustrator then prepared a draft of chapters of the graphic novel, which was workshopped with the pupils who provided feedback on what worked for them and suggestions as to what they would like to see changed.

The book is aimed at pupils in S1, S2 and S3 levels of secondary school, which translates to children aged between 11 and 15 years of age. It is available as a free pdf on the SBT website (<http://www.scottishbooktrust.com/learning/teachers-librarians/teaching-resources-cpd/john-muir/download>). SBT also provides a set of linked activities on their website, which were also part of this evaluation.

### 1.3. Distribution of book

Classroom sets of 24 books were shipped to 578 secondary schools (see Table 1) directly from Education Scotland's warehouse addressed for the attention of Eco-Schools coordinators or to classroom teachers (in those schools without Eco-Schools coordinators). Approximately 14,000 books were sent out. Delivery was tracked. A letter was also sent directly to named Eco-Schools coordinator for each school by Keep Scotland Beautiful, who administer the Eco-Schools network, on behalf of SBT. The letter let coordinators know that the books were coming, outlined SBT's desire that they be used cross-curricularly, and provided the web address for SBT's support materials. It also let schools know who had supported and sponsored the project.

**Table 1: Number of Secondary Schools by Type**

Type of school	Number in Scotland
Local Education Authority:	370
Independent	49
Local Education Authority Special	119
Independent Special	34
Grant Aided	6

#### **1.4. Project outcomes**

The outcomes SBT set out to achieve with the graphic novel and linked activities were as follows:

- 1) To increase pupils' awareness of the value of the natural environment.
- 2) To encourage attitudes, values and dispositions relevant to responsible behaviour around enjoying, respecting and preserving our natural environment.
- 3) To encourage pupils to become actively involved in the protection and restoration of wild places.
- 4) To contribute to pupils' understanding of the natural environment and how this can be addressed through a variety of subjects: literacy, expressive arts, health and wellbeing, sciences, social studies, technology, and R and E.

The research outlined in this report set out to examine how the graphic novel was received by and used in secondary Schools and how these uses impacted on pupils' awareness, attitudes, understandings, values and behaviours

#### **1.5. Why books matter**

Books matter. People who love to read have always known this. However, recent studies in fields such as neuropsychology, psychology and sociology have begun to provide research evidence that books help people to process difficult emotions and experiences, make ethical decisions and develop empathy and shift attitudes and opinions.

Studies in the psychology of literature and reading have shown that fluent readers reflect on their own lives and experiences as they read [1]. Literacy is an important part of enabling such reflection as reflection happens in the gap between the speed at which a proficient reader understands the words and the pace at which he or she moves through the text [2]. Stories provoke more of this self-reflection than do plain prose descriptions [1]. Studies have shown that even just one reading of a short story can lead to changes in people's emotional assessment of a personal experience, provided the person is open to self-reflection and the story chosen evokes relevant experiences [1].

Some researchers even go so far as to suggest that people construct their

identities and sense of self through the stories that they tell about themselves and the stories others tell about them [3]. People use the stories that are provided to them by the cultures they live in through television, video games, movies and books to make sense of their experiences. Psychology has shown that those experiences which are not incorporated into people's storied-identities are soon forgotten [4]. Finally, there is evidence that reading literature helps readers develop empathy and expands who they extend compassion towards [5].

This research provides us with a basis to anticipate that providing books that tell stories which children might not come across elsewhere could make a difference to the way they see themselves, the way they relate to nature and the choices they make in relation to the environment.



## Chapter 2: Methods Used in the Evaluation

### 2.1. Introduction

Our research set out to discover whether SBT's desired outcomes for the graphic novel and support materials had been achieved, what helped teachers and pupils arrive at these outcomes and what barriers were encountered. To that end, we used three separate research methods:

- 1) The core method we used was a pupil survey, which was filled in before and after pupils used the graphic novel (see Appendix A). Twelve secondary schools participated. To help us understand the results of this survey, where possible we also collected information from their teachers about how the book was used. These uses have been compiled into the case studies at the end of this report.
- 2) A survey was also shared with secondary school teachers across Scotland through Survey Monkey. Sixty-two teachers completed this survey (see Appendix B).
- 3) Website analytics statistics were also collected for the support materials website provided by SBT

In addition, we received a number of unsolicited emails directly from teachers, sharing their views.

### 2.2. Measuring Changes in Pupil Attitudes

The central research method used in this evaluation was a pupil survey designed to measure changes in attitudes towards the environment in classes that used the graphic novel. Studies of children's participation in research indicates strong support from them for survey-type research as they feel that surveys and questionnaires allow everyone to participate equally and are therefore fair ways in which they can share their views with researchers [6].

Shifting attitudes is a slow and complex process and attempts to document

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changes in environmental education programmes do not always manage to do so. To the best of our knowledge no one has tried to measure environmental attitude shifts in relation to the use of a book before.

In late April 2014, a random sample of 100 secondary schools was sent a class set of pupil questionnaires that included two scales designed to measure attitudes towards the environment (the New Environmental Paradigm scale, modified for children) and sense of connection to nature (the Inclusion of Nature in Self scale). Further information about these two scales is provided for interested readers in the following subsections. The questions making up the scales can be found in Appendix A.

Teachers were asked to have their pupils fill out these questionnaires before they used the book with them. In line with University of Edinburgh ethics policies, sheets explaining the evaluation research to parents were included, as was an opt-out form allowing parents to excuse their children from the exercise if they did not want them to participate. Pupils themselves could opt out of participating by not filling out the questionnaire.

Participating pupils filled out the questionnaire again after they finished working with the book. The teachers administered the questionnaires themselves in a diversity of teaching contexts and with a variety of uses of the book, so there is wide variation in the time between the two questionnaires and even in the timing of the questionnaire in relation to the book's use.

In total, we received 282 sets of before and after questionnaires (a total of 564 individual questionnaires) from twelve schools. An additional 72 questionnaires could not be used because there was no matching before or after questionnaire (presumably because pupils were absent on one of days on which the questionnaire was conducted) or because a questionnaire had been spoiled in some way, most often through a failure to answer all the questions.

### **2.2.1. The New Environmental Paradigm Scale**

Since the 1960s, when environmental issues first came into view as significant problems, a large number of studies have been undertaken aimed at measuring attitudes and values towards the environment. Early researchers argued that the dominant social paradigm (DSP), which understood nature as a resource to be exploited by human beings, was being challenged by a new environmental paradigm (NEP) and that such a shift is essential if environmental destruction is to be stopped [7]. In order to measure this shift, in 1978 two researchers named Dunlap and Van Liere developed the "New Environmental Paradigm" scale. The NEP scale has since become one of the most widely used measures of environmental concern [8]. While it was developed in the U.S.A., it has also been used in other countries and in a range of contexts.

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While the revised NEP scale measures the sorts of attitudes that SBT is interested in impacting upon, the wording of the questions was too complex for children 11 years of age. Therefore, a comparable scale specifically developed for children in this age group was sought. In 2007 Manoli et al. published a version of the NEP scale that they had created for children 10-12 years of age [7]. This scale was the result of three years of rigorous development and testing involving approximately 800 children across more than 25 schools with different demographic profiles, although all were in the USA. The resulting NEP Scale for Children includes only 10 of the 15 items in the current adult version.

In the American study, the NEP Scale for Children works both as a unidimensional scale (compiling all the item answers into a single score) and as a multidimensional scale measuring Rights of Nature (combining questions 1,4, 7), Eco-Crisis (2,5,8,10) and Human Exemptionalism (3, 6, 9) [7]. The ability to use it both as a single scale or as a set of sub-scales makes it comparable to the adult version.

The NEP Scale for Children was found to be sensitive enough to pick up small but statistically significant changes in children's attitudes before and after attending a five-day environmental education programme [7]. Although the children's pre-test scores in this study already showed a predisposition to environmental world views, change in world views is usually a very slow process, so finding **any** significant difference before and after the programme was considered an important result. Its ability to pick up small changes makes the NEP Scale for Children the ideal tool to evaluate that impact that the use of the John Muir graphic novel had on pupils' attitudes towards the environment.

### 2.2.2. The Inclusion of Nature in Self Scale

Rather than measuring attitudes, as the NEP does, the Inclusion of Nature in Self Scale (INS) represents one way of measuring a person's sense of connectedness to nature. The scale originated in the field of social psychology and was first developed by Aron et al. as the Inclusion of Other in the Self Scale to measure interpersonal relationships and levels of closeness between humans [9].

Schultz adapted the INS Scale to measure the extent to which individuals include nature in their sense of self or identity [10]. It is a single question scale that consists of 7 sets of two concentric circles representing self and nature, which change from not overlapping at all to overlapping completely (see Appendix A).

According to this approach, the more closely nature is included in a person's representation of self, the more nature is valued. Schultz suggests that higher inclusion scores (higher overlap between circles) correlate with greater concern for plants and animals, more care for nature, and more environmentally friendly behaviours [10].

Theories in environmental psychology, philosophy and eco-psychology all

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suggest that a feeling of interconnectedness with nature is an important precondition for environmental behaviour. The INS therefore serves as a useful expansion of the NEP Scale, which similarly stresses the interconnection between humans and nature and sees humans as a part of nature but which emphasises attitudes more than personal identity.

The INS scale has not been used widely with children. However, due to its pictorial nature, it does not depend heavily on verbal or written skills and is therefore straightforward to use with them.

### 2.2.3. Analysis of Pupil Survey

Teachers returned class sets of pre- and post-questionnaires, which included both the NEP and the INS. The data from these were double-entered into a spreadsheet in order to ensure there were no transcribing mistakes.

The version of the NEP scale for children that was used in this study was a 10-item 5-part Likert-type scale ranging from "Strongly-Agree" to "Strongly-Disagree" with "Not Sure" in the middle. Six of these items measure agreement with the NEP (1,2,4,5,8 and 10), while the remaining four items measure agreement with the DSP (3, 6, 7 and 9) [7]. The four measuring DSP were reverse scored for analysis so that all items measured movement away from the DSP and towards the NEP positively.

The INS scale is a one item graphic scale with 7 choices moving from self and nature being fully separate to self and nature being fully integrated.

For each class for each of the NEP and the INS scales we calculated the following:

- The average score before using the book
- The average score after using the book
- The average pupil change in score

We then performed a statistical test, called a paired t-test, which measures whether the observed change in the score across pupils was likely to be random or the outcome of an underlying, repeatable cause. We used the standard 95% confidence interval for our analyses. A confidence interval tells us that if we repeated this same study 100 times, the average would be within the lower end and the higher end of the confidence interval 95 times. In the case of this evaluation, two of the outcomes that SBT would like from this project (1 and 2) involve positive changes in valuing nature and in attitudes towards nature. Statistically, such a change would be measured by a 95% confidence interval that did not contain zero and that did contain only positive values. If we found such a result, we could be fairly confident in saying that the common experience between all the pupils, in this case the book, contributed to the observed change.

To help us interpret the findings from the pupil survey, we asked participating class teachers to fill out a form outlining how the book was used, what SBT-supplied supporting activities were used and whether any other environmental activities were engaged in. Teachers were also asked to fill in a hard-copy version of the survey discussed below and were asked if they would participate in a short follow-up interview. The information from these sources, along with additional demographic information from public sources, was compiled into the individual case studies included at the end of this report.

### **2.3. Teacher Survey**

While impacting on pupils is at the core of SBT's John Muir graphic novel project, this impact can only be achieved if teachers are using the book. In order to get a sense of teachers' experience of using the book and support materials, a survey was created on Survey Monkey (see appendix B). Teachers were asked to participate in this survey via emails sent out to all secondary school EcoSchool coordinators by Keep Scotland Beautiful. As the books themselves were addressed to this same set of teachers, we hoped to reach all teachers who had received a class set of the books through these emails. Emails were sent out in June and December 2014.

The survey is a mix of Likert-type questions that ask the teachers to rate the extent to which they agree or disagree with a number of statements relating to SBT's desired outcomes as well as open-ended questions that gathered information about how the book was used, which activity was most useful and why they had answered the Likert-type questions in the way that they had. Teachers who had not used the book were invited to tell us why.

In total, 62 teachers filled in a questionnaire, this includes nine teachers who participated in the pupil survey. The results of this survey were summarised into an overview of teacher agreement or disagreement with the evaluative statements. Responses to the open-ended questions were collated and grouped thematically.

### **2.4. Website Analytics**

The final set of data used in this evaluation research was the website analytics from the SBT's website for the John Muir graphic novel. This website consists of a homepage with links to free pdf downloads of the graphic novel as well as links to various support materials and activities that have been produced and curated by SBT. Information about the website and support materials are included in the graphic novel, as are symbols that suggest appropriate places in the graphic novel in which to pause and make use of specific activities.

The period over which website statistics were collected for the purposes of this evaluation ran from April through to December 2014. The information collected provided insight into the use of online teaching resources provided by SBT on their website. However, as it is a public site, anyone can access it, not just Scottish secondary school teachers and the analytics do not distinguish between viewers. The website statistics were collected using Google Analytics.

Google Analytics measures three main aspects of users' online activity: the frequency with which particular sites were being visited, the pages through which users entered the site most frequently, and which pages had the highest (and lowest) "staying-on" rates, a measure of whether users explored the website further after entering through a particular page. Google Analytics collated data on all these activities in four-week intervals. However, it did not use the same 4-week period for all the different pages or for all the different measures, so there are a few minor discrepancies in the periods covered.

## Chapter 3: The Evaluation in Numbers

This chapter presents the full numerical findings from the three research methods outlined in the previous chapter. These data, along with the answers to open-ended questions and information gleaned from interviews and emails, are discussed in relation to SBT's four desired outcomes in chapter 4.

### 3.1. Pupil Survey: Impact of Book on Students

The pupil attitudes survey measured the change in attitudes towards and connection with nature after using the book. For the NEP, an increase in the score would indicate a shift towards more pro-environment attitudes and values. For the INS, an increase in score indicates feeling more connected to nature.

In most classes there was a positive mean change between the pre- and post-questionnaires on the NEP, indicating that on average pupils tended to shift towards the NEP after working with the book (see Table 2). The highest average change was a mean change of 2.17 in one of school L's classes, closely followed by a mean change of 2.09 in school B. However, two schools (D and G) showed very small negative average changes (-0.214 and -0.143) as did one of the other classes in school L (-0.283). When we look at the t-tests, we can see that the shift in attitude is only statistically significant in three of the classes, School B and Lii and Liv.

**Table 2. New Environmental Paradigm for Children Statistical Analysis**

	n	Mean before	Mean after	Mean difference	95% confidence interval		t statistic	p-value
					Minimum difference	Maximum difference		
School A	22	37.09	37.09	0.000	-1.284	1.284	0.000	1.000
School B	22	35.23	37.32	2.090	0.382	3.798	-2.545	0.019
School C	17	34.59	35.47	0.882	-1.387	3.152	-0.824	0.422
School D	14	37.00	36.79	-0.214	-1.668	1.239	0.318	0.755
School E	8	32.38	33.75	1.375	-0.670	3.420	-1.590	0.156
School F	28	35.18	36.21	1.036	-0.769	2.841	-1.177	0.249
School G	14	35.79	35.64	-0.143	-1.895	1.609	0.176	0.863
School H	20	35.25	35.65	0.400	-1.706	2.506	-0.398	0.695
School I	14	35.86	36.14	0.286	-1.844	2.415	-0.290	0.776
School J	13	36.08	37.58	1.500	-0.979	3.979	-1.318	0.212
School K	11	33.18	34.36	1.182	-1.382	3.746	-1.027	0.328
School Li	23	35.80	35.52	-0.283	-1.712	1.147	0.410	0.686
School Lii	23	36.43	38.61	2.174	1.363	2.985	-5.562	0.000
School Liii	18	37.17	37.44	0.278	-0.914	1.469	-0.492	0.629
School Liv	21	33.52	35.24	1.714	0.426	3.003	-2.775	0.012
Combined Data	268	35.51	36.35	0.840	0.417	1.263	-3.908	0.000

The average changes observed on the Inclusion of Nature in Self scale are much smaller, with the largest mean change being 0.75 in School E (see Table 3). However the highest potential score on that scale is smaller than the one for the NEP. Again, there is an overall positive trend in the average changes, with two classes having statistically significant changes, Li and Lii. However, there are two schools (B and H) with an average change of zero and two schools (J and K) with a negative change that is comparable in size to many of the positive averages. Interestingly, B demonstrated a strong, statistically significant positive changes in the NEP scale, so changes in the INS scale do not necessarily mirror those in the NEP scale in this study.



**Table 3. Inclusion of Nature in Self Statistical Analysis**

	n	Mean before	Mean after	Mean difference	95% confidence interval		t statistic	p-value
					Minimum difference	Maximum difference		
School A	22	3.95	4.00	0.045	-0.274	0.366	-0.295	0.770
School B	22	5.00	5.00	0.000	0.000	0.000	0.000	1.000
School C	17	4.06	4.41	0.353	-0.008	0.714	-2.073	0.055
School D	14	3.14	3.43	0.286	-0.067	0.639	-1.750	0.104
School E	8	4.13	4.88	0.750	-0.224	1.724	-1.820	0.111
School F	28	3.61	4.07	0.464	-0.089	1.018	-1.722	0.096
School G	14	4.00	4.14	0.143	-0.356	0.642	-0.618	0.547
School H	20	3.75	3.75	0.000	-0.456	0.456	0.000	1.000
School I	14	3.43	3.86	0.428	-0.410	1.267	-1.104	0.290
School J	13	4.69	4.46	-0.231	-0.593	0.131	1.389	0.190
School K	11	3.82	3.45	-0.364	-1.612	0.885	0.649	0.531
School Li	23	4.39	4.83	0.435	0.148	0.721	-3.148	0.005
School Lii	23	4.35	4.74	0.391	0.079	0.704	-2.598	0.016
School Liii	18	4.17	4.39	0.222	-0.050	0.495	-1.719	0.104
School Liv	21	3.90	4.10	0.190	-0.151	0.532	-1.164	0.258
Combined Data	268	4.04	4.26	0.216	0.103	0.329	-3.773	0.000

When the surveys from pupils across all schools were combined together, we found a small but statistically significant positive change in both the NEP (0.840) and the INS (0.216) over the time period during which the John Muir graphic novel was used. Given the challenges to changing attitudes, finding any statistically significant change is an important result.

In order to explore which parts of the NEP changed the most, we ran the t-test for all pupils for the three NEP subscales: Rights of Nature, Eco-Crisis and Human Exemptionalism (see Table 4).

**Table 4. NEP Subscales Statistical Analysis**

Subscales	Mean before	Mean after	Mean difference	95% confidence interval		t statistic	p-value
				Minimum difference	Maximum difference		
Rights of Nature	11.78	12.22	0.440	0.257	0.623	-4.736	0.000
Eco-Crisis	15.03	15.38	0.351	0.083	0.618	-2.579	0.010
Human Exemptionalism	8.70	8.75	0.049	-0.180	0.277	-0.419	0.676

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From this analysis, we can see that the greatest change (0.440) happened across those questions having to do with the Rights of Nature (questions 1,4,7). This change was statistically significant. Changes in the Eco-Crisis subscale, which measures four questions (2,5,8,10), were smaller but still significant (0.351), while there was almost no shift in attitudes relating to Human Exemptionalism (3,6,9) and those changes were not statistically significant. This means that most of the shifts in attitudes seen in these pupils were in relation to attitudes regarding the rights of nature and an eco-crisis.

Eleven teachers filled out the teacher form when they returned the pupil surveys and nine filled out a hardcopy of the teacher survey. We were able to interview four teachers and followed-up with three more via email to supplement the information from the forms and surveys. This information, along with demographic and geographical information for the school and its catchment area were used to build the case studies that have been included in the appendices. This information has been anonymised to protect the privacy of the participating schools.

Unfortunately, four sets of before and after questionnaires were returned to us with no indication of which school they came from. We have designated this school as L. The only information provided was that the book was used in science classes. We attempted to discover which school this was so that we could create a case study for it, but were unable to do so. This is particularly regrettable because this school demonstrated some of the most significant changes.

Information from these case studies informs the discussion in the following chapter.

### **3.2. Teacher's Survey: Evaluation of Book and Support Materials**

Sixty-two teachers completed the teacher survey. Of these, three quarters had used the book, while one quarter had not. Forty-three teachers completed questions asking them about their experiences of and opinions about the book and support materials (see Table 5). Pie-charts of key responses are provided in the following chapter. Teachers who used the book were very positive in their evaluation of it.

**Table 5. Teacher evaluation of the graphic novel**

	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree	Response Count
Children in my class enjoyed reading the John Muir graphic novel	10	30	1	0	1	42
The graphic novel was pitched at an appropriate level for my pupils	9	27	5	1	1	43
The graphic novel fits well with the Curriculum for Excellence	14	27	2	0	0	43
The graphic novel provided an engaging way to raise environmental issues in the classroom	14	22	5	2	0	43
The graphic novel increased pupil's awareness of the value of the natural world	12	19	10	1	0	42
Engaging with the graphic novel led to a noticeable increase in pupils exhibiting environmental behaviours such as recycling, composting and picking up litter	2	8	23	9	1	43
The graphic novel, support notes and activities impacted on pupils' sense of connection with the natural world	5	17	16	4	0	42
The graphic novel, support notes and activities impacted on pupils' sense of connection to the place where they live	5	12	20	4	0	41
I would use the graphic novel again with a class	18	22	1	3	0	43
I would recommend the graphic novel to other teachers	16	22	2	3	0	43
The teaching support notes and pupil activities linked well with the graphic novel	3	21	16	2	0	41
The teaching support notes and pupil activities were pitched at an appropriate level for my pupils	5	15	18	1	1	40
The teaching support notes and pupil activities fit well with the Curriculum for Excellence	7	15	19	0	0	41
I would use the teaching support notes and pupil activities again with a class	5	15	19	2	0	41
I would recommend the teaching support notes and pupil activities to other teachers	9	12	18	3	0	42

Overall, teachers were positive about the support notes and pupil activities. However, many more teachers ticked the "not sure" box for these questions than for the book itself (ranging from 16 to 20). Teachers who ticked "not sure" were mostly the ones who had not used the support materials.

### 3.3. Website Analytics: Use of Support Materials

As might be expected, the John Muir entry page received the highest number of page views each month and over the whole April to December period (total of 4013), followed by the download page for a pdf version of the book (2244) (see Table 6). The initial month of April saw the peak of the activity followed by a steady drop over late spring and summer, with a renewed increase of activity in August and September, marking the beginning of the new school term.

**Table 6. Website analytics for pages**

	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Overall
John Muir entry page	1671	671	333	185	254	323	289	287	4013
Download John Muir	1004	415	152	73	141	158	121	180	2244
Teaching Support Notes	322	233	114	14	77	81	61	77	979
Support Notes by subject	98	84	40	15	21	11	21	34	324
William Goldsmith	79	68	17	17	24	13	21	20	259
John Muir - Glossary	65	20	8	5	6	9	6	15	134
Q&A: Julie Bertagna	84	11	5	0	4	1	6	10	121
John Muir Way to greener future	21	38	16	3	11	5	6	10	110

The John Muir Quiz was the most popular activity, with 353 hits, followed by Birds and Now and Then (see Table 7). Visits to these pages also dipped over the summer.

**Table 7. Website analytics for activities**

	April-May	May-June	June-July	July-August	Aug-Sept	Sept-Oct	Oct-Nov <sup>1</sup>	Nov-Dec	Total
John Muir Quiz	52	34	13	8	14	19	NA	NA	353
Birds	51	20	11	2	16	13	NA	NA	268
Now and Then	21	9	6	2	8	4	NA	NA	225
Beneath Our Feet	36	24	13	4	13	6	NA	NA	185
Invent Design Make	31	22	6	2	10	12	NA	NA	182
Exploring Nature	33	20	6	4	19	6	7	10	105
Then and Now	24	12	6	2	4	5	NA	NA	98
Here To There	31	12	10	3	8	9	5	5	83
Creative Journaling	21	17	6	9	6	8	0	15	82
Biodiversity	26	17	8	3	8	7	2	4	75
National Parks	24	17	11	3	7	3	3	2	70
Nature Detectives	24	10	8	1	17	6	2	1	69
Photosynthesis	20	9	11	2	8	5	3	2	60
Proactive Conservation	23	10	7	2	6	4	1	5	58
Glaciers	15	14	4	1	7	7	3	6	57

Most users (2929) entered the website via the John Muir entry page. A majority of those, 62%, explored the website further after this. A significant number of site visitors (669) used the download page as their point of entry. Roughly half of them stayed on. The William Goldsmith interview page (122 entries/65 staying on) and the teaching support notes (90 entries/67 staying on) likewise provided popular points of entry.

With staying on rates of 62% and 59% respectively, users who entered the John Muir pages via the teaching support notes or the teaching support notes by subject were especially likely to remain on the website. Conversely, users entering via the Julie Bertagna Q&A (26% staying on) or the John Muir Muir Way to a Greener Future (27% staying on) were least likely to further engage with the website, suggesting that these visitors had come to these pages with an interest in Julie Bertagna and the John Muir Way, rather than in the graphic novel.

Overall, April through to June witnessed the highest level of activity, with April taking the lead. Numbers slump somewhat over the summer and pick up again slightly during early autumn.

<sup>1</sup> Data for individual months was not available for all of the pages. However, overall data covers all of the months from April to December.

**Table 8. Website analytics: entrances, bounces and staying on rates**

	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Overall
<b>John Muir Entry Page</b>									
Entrances	1,353	442	252	146	180	216	203	137	<b>2,929</b>
bounce rate	42%	32%	35%	48%	34%	44%	49%	21%	<b>38%</b>
bounces	574	143	87	70	62	95	99	29	<b>1,159</b>
staying on rate	58%	68%	65%	52%	66%	56%	51%	79%	<b>62%</b>
Numbers staying on	779	299	165	76	118	121	104	108	<b>1,770</b>
<b>Download John Muir</b>									
entrances	336	174	29	12	44	24	13	37	<b>669</b>
bounce rate	57%	54%	29%	21%	41%	46%	27%	45%	<b>40%</b>
bounces	191	94	8	3	18	11	4	17	<b>346</b>
staying on rate	43%	46%	71%	79%	59%	54%	73%	55%	
Numbers staying on	145	80	21	9	26	13	9	20	<b>323</b>
<b>Teaching Support Notes</b>									
entrances	30	30	9	1	6	6	7	1	<b>90</b>
bounce rate	17%	20%	22%	100%	33%	50%	43%	100%	<b>48%</b>
bounces	5	6	2	1	2	3	3	1	<b>23</b>
staying on rate	83%	80%	78%	0%	67%	50%	57%	0%	<b>52%</b>
Numbers staying on	25	24	7	0	4	3	4	0	<b>67</b>
<b>William Goldsmith</b>									
entrances	24	20	5	15	17	10	16	15	<b>122</b>
bounce rate	75%	60%	80%	60%	18%	60%	50%	31%	<b>54%</b>
bounces	18	12	4	9	3	6	8	5	<b>65</b>
staying on rate	25%	40%	20%	40%	82%	40%	50%	69%	<b>46%</b>
Numbers staying on	6	8	1	6	14	4	8	10	<b>57</b>
<b>John Muir Way to Greener Future</b>									
entrances	6	14	4	4	4	4	3	4	<b>43</b>
bounce rate	33%	50%	75%	100%	75%	75%	100%	75%	<b>73%</b>
bounces	2	7	3	4	3	3	3	3	<b>28</b>
staying on rate	67%	50%	25%	0%	25%	25%	0%	25%	<b>27%</b>
Numbers staying on	4	7	1	0	1	1	0	1	<b>15</b>

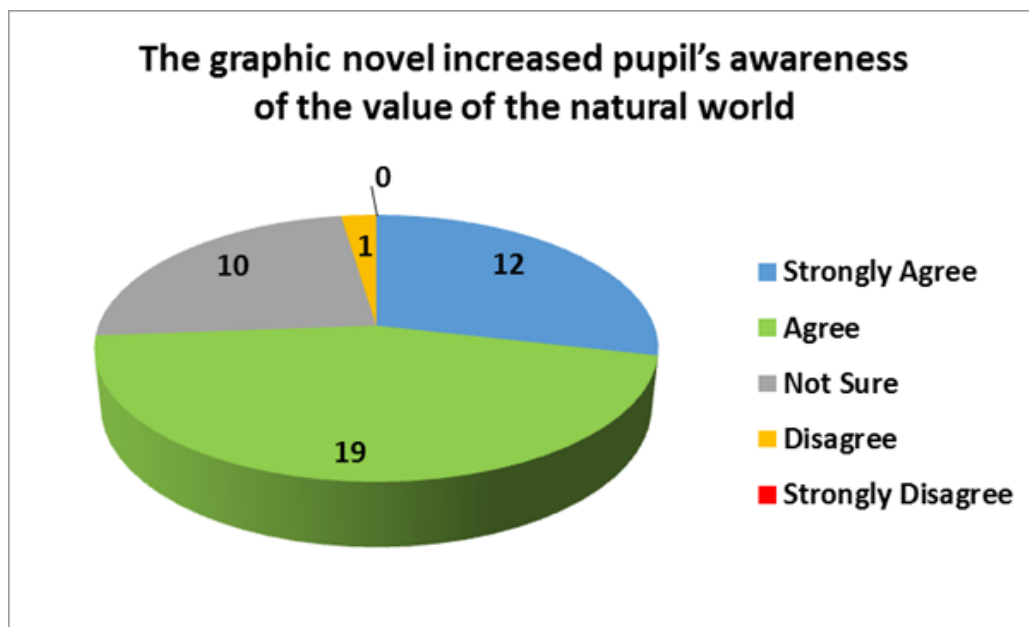
	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Overall
<b>The John Muir Quiz</b>									
entrances	9	11	7	0	3	1	3	2	<b>36</b>
bounce rate	56%	45%	43%	0%	33%	100%	33%	50%	<b>45%</b>
bounces	5	5	3	0	1	1	1	1	<b>17</b>
staying on rate	44%	55%	57%	0%	67%	0%	67%	50%	<b>42%</b>
Numbers staying on rate	4	6	4	0	2	0	2	1	<b>19</b>
<b>Support Notes by Subject</b>									
entrances	9	14	3	1	1	1	7	1	<b>37</b>
bounce rate	33%	7%	33%	100%	0%	0%	57%	100%	<b>41%</b>
bounces	3	1	1	1	0	0	4	1	<b>11</b>
staying on rate	67%	93%	67%	0%	100%	100%	43%	0%	<b>57%</b>
Numbers staying on	6	13	2	0	1	1	3	0	<b>26</b>
<b>Q &amp; A with Julie Bertagna</b>									
entrances	42	4	2	/	2	1	3	4	<b>58</b>
bounce rate	79%	50%	100%	/	50%	100%	67%	75%	<b>74%</b>
bounces	33	2	2	/	1	1	2	3	<b>44</b>
staying on rate	21%	50%	0%	/	50%	0%	33%	25%	<b>26%</b>
Numbers staying on	9	2	0	/	1	0	1	1	<b>14</b>

## Chapter 4: Did the Project Meet its Desired Outcomes?

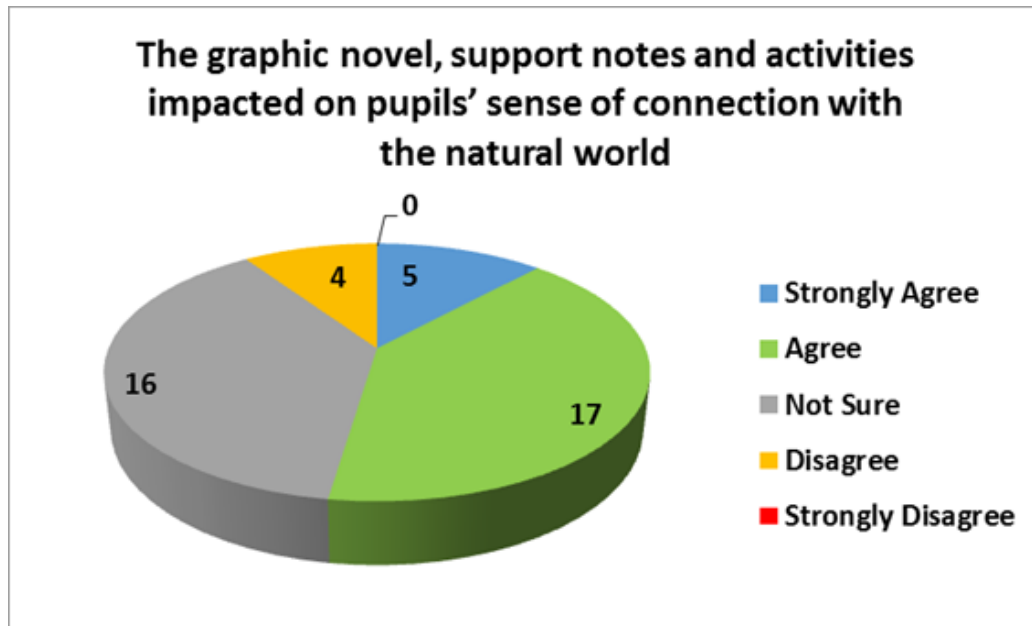
In this chapter, we return to SBT's desired outcomes and look at the evidence we have collected to determine whether these outcomes have been met or not.

**4.1. Outcome 1.** To increase pupils' awareness of the value of the natural environment.

Thirty-one teachers (out of 42) agreed or strongly agreed with the statement: "the graphic novel increased pupils' awareness of the value of the natural world, and just over half agreed that the novel, support notes and activities impacted on pupils' sense of connection with the natural world: 22 agreed or strongly agreed, 4 disagreed and 16 were not sure.







We also measured pupils' sense of connection to nature directly using the Inclusion of Nature in Self Scale (INS). Our analysis of the pupil survey found a small but statistically significant positive increase on the INS (mean shift of 0.22), with 4 classes having mean shifts of over 0.40 and 1 class having a mean shift of 0.75. The total possible score on this scale is 7.

As far as we are aware, no one has ever before measured a statistically significant shift in connection to nature facilitated by reading a book. John Muir provides a strong example of someone who has a close relationship to nature and whose identity is tied to nature. The findings from this scale provide some indication that having such a storied role model does impact on the pupils who read the book.

As can be seen in the case studies (included in the appendix) the book was used in a variety of ways, often in association with other activities. Based on teacher observations and the statistically significant change seen in the INS, we conclude that in participating schools, working with this book in association with other educational activities, did positively shift pupils' awareness of the value of nature and their sense of connectedness with the natural world.

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**4.2. Outcome 2.** To encourage attitudes, values and dispositions relevant to responsible behaviour around enjoying, respecting and preserving our natural environment.

The NEP scale is a well established way of measuring changes in attitudes in relation to the natural world and environmental issues. The NEP has been associated with behaviour change in other studies. On average, pupils shifted 0.84 points after working with the graphic novel, which was usually done alongside other activities. This was a small but statistically significant finding. Individual classes shifted as much as 2.09 and 2.17, both of which were also statistically significant. Again, we believe this is the first time that such a change has been documented in relation to the use of a book.

The NEP can be divided into three subscales representing attitudes regarding the rights of nature, whether there is an eco-crisis and rejection of human exemptionalism. When pupil responses were analysed according to these sub-scales, it became apparent that most of the observed change in their overall scores occurred in the sub-scales of the rights of nature (0.44) and eco-crisis (0.35), both of which showed statistically significant shifts. There was almost no shift in attitudes towards human exemptionalism. This echoes the attitudes depicted in the John Muir graphic novel. There are plenty of examples in the story of John Muir being and feeling connected to nature, of him valuing the rights of nature and acting to protect wild places. However, in its emphasis on John Muir's talents as an innovator and inventor, the book may actually support the ideas in questions 3 and 9 ascribed to the DSP by the creators of the NEP, that humans are clever enough to avert disaster and that people will eventually know enough about nature to control it. By looking at the subscales, it seems that shifts in the NEP match the orientation of the book, further supporting the idea that the book itself (and not just the environmental activities) played an important part in shifting pupil attitudes.

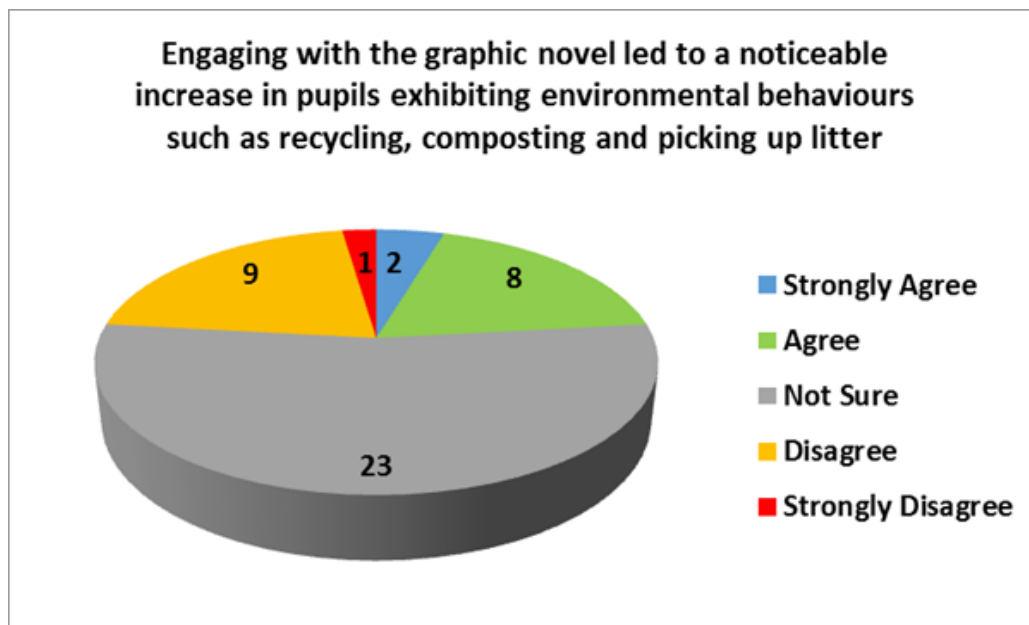
Finally, at least two of the schools used the book to stimulate discussion around environmental attitudes, one in a religious education module concerning the exploration of "their attitudes to animals and earth" (School F), and the other in an Enrichment Module on the Environment (School J)

Given the statistically significant shifts in both the NEP and INS (discussed above), we conclude that working with the book alongside other activities did encourage attitudes, values and dispositions relevant to responsible behaviour around enjoying, respecting and preserving our natural environment in this group of schools. The close links between the values demonstrated in the book and the shifts in the subscales of the NEP point towards the importance of the book itself in facilitating these changes.

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**4.3. Outcome 3.** To encourage pupils to become actively involved in the protection and restoration of wild places.

When asked whether engaging with the graphic novel led to a noticeable increase in pupils exhibiting environmental behaviours, only 10 teachers agreed or strongly agreed, while an equal number disagreed or strongly disagreed and the remaining teachers were not sure.



It is not surprising that teachers were divided over whether the book led to changes in behaviour. Decisions to change behaviours are complex and may be slow to develop over time. While a single "narrative resource" such as the John Muir graphic novel may feed into decision-making processes, it would be extremely difficult to make a direct connection between such a resource and a later behaviour. Behaviour change usually arises through multiple encounters with an idea and/or an action and requires a supportive community to be sustained.

As has already been established, on average pupils did shift attitudes related to behaving in environmentally responsible ways, so there is already evidence that working with this book can contribute to pupils becoming actively involved in the protection and restoration of wild places.

Another reason teachers may have been unsure about the book's role could be because just over half surveyed were already engaging their pupils in such activities during the period in which the book was being read.

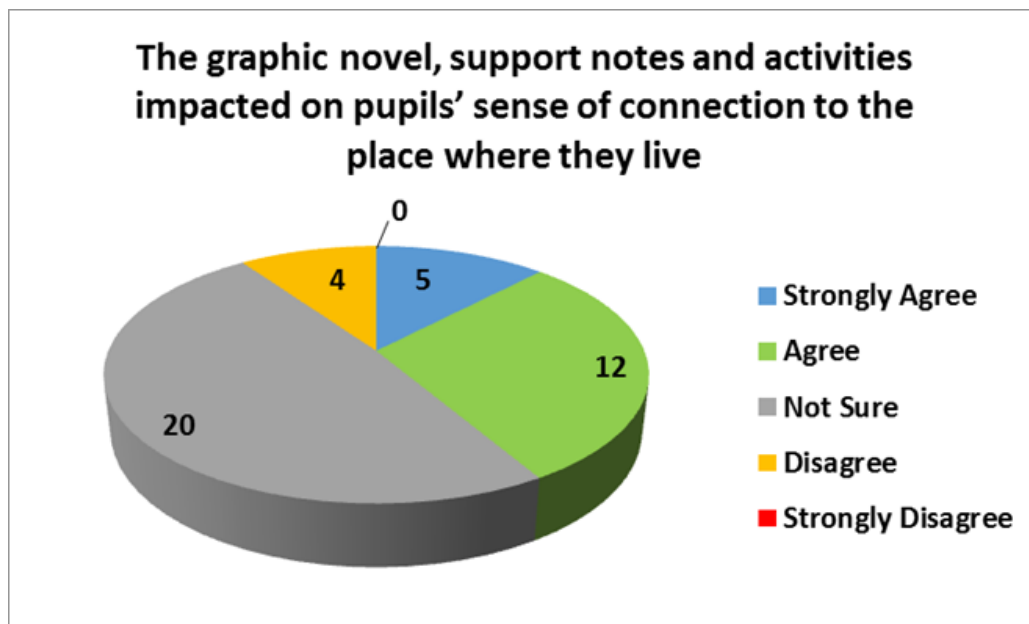
The graphic novel enriched an already existing John Muir Award scheme in a total of 17 instances. In these cases, the book was used alongside planned outdoor and

conservation activities. Organising conservation days for pupils can be reasonably assumed to encourage pupils to become involved with conservation. Five teachers specifically mentioned that pupils were engaged in Eco-Schools activities during this time. Other activities that were listed include: beach cleans, picking up litter, recycling, gardening, composting, pond dipping, moth catching, renewable energy competition, uprooting invasive species in a woodland, forest and marine conservation, visits from conservation organisations, learning how to build a responsible cook fire outdoors, and conservation of/managing school grounds.

The book was also used to critically discuss conservation practices. School D discussed the topic of proactive conservation with reference to the graphic novel and to John Muir's life and work. A group of older pupils in School H used the book as part of a critical engagement with the aims and limitations of national parks around the world.

In at least one case, using the book with her class encouraged a teacher to locate a "wild" place that she could bring future pupils too in order to make better use of the supplemental activities that involved being outdoors (School H).

Finally, having a sense of connection to the place where they live might be considered a contributing factor to getting actively involved in conservation work near home. Teachers surveyed were a little more convinced that the book and support activities increased pupils' connectedness to place.



We conclude that pupils at many Scottish secondary schools are already actively involved in the protection and restoration of wild places, that the book and support materials may convince more teachers to engage their classes in such activities, and that

the book complements such activities and may help to reinforce such behaviours through its impact on attitudes.

**4.4. Outcome 4.** To contribute to pupils' understanding of the natural environment and how this can be addressed through a variety of subjects: literacy, expressive arts, health and wellbeing, sciences, social studies, technology, and R and E.

The vast majority of the teachers surveyed had used or intended to use the book (54 out of 62). Teachers reported using the book with S1, S2, S3 and even S4 pupils in the following subjects: geography, environmental science, biology, religious education, English, enrichment and interdisciplinary learning. Most of the teachers who used the book would do so again and would recommend it to other teachers.

The book was used by the teachers who filled out the survey in a range of ways, the bulk of which fell into the non-exclusive categories of:

- Outdoor education
- Reading, literature and literacy
- Environmental education

Seventeen teachers used the graphic novel as part of the John Muir Award, and a further two introduced the person and life of John Muir to pupils through the book. One teacher read the book privately to educate herself about the life of John Muir. A couple of teachers created multi-lesson units around the book in relation to John Muir. In two instances, the graphic novel was used explicitly to reinforce aspects of outdoor learning.

Ten schools focused on reading, comprehension and discussion in class. Of those, two also studied the graphic novel genre as part of their work. Literacy likewise was a central focus for two teachers who used the book in an interdisciplinary manner, one in interdisciplinary learning, one in literacy in science. It was also used by a class to study the Scots language. One teacher noted that the book proved engaging to pupils with diverse learning difficulties thanks to its combination of text and image, and two other teachers experienced increased interest from otherwise reluctant readers and writers: "I noticed that pupils who would not usually be happy to write were very busy writing a few sentences" during a writing exercise about the book. Finally, the book was studied by the John Muir Group at one school and an Eco-Schools group at two other schools.

The teaching notes and support materials were sourced from and were targeted at a range of subject areas. The teaching support notes page on the website was accessed 979 times between April and December and the support notes by subject page received 324 hits. That the people viewing these notes were mostly teachers is

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evidenced by the pattern of access, which saw a dip in use during the Scottish summer holidays. A range of online activities applicable to a diversity of subject areas were accessed. Those that were clicked on the most were the John Muir Quiz (353), Birds (268 hits), Now and Then (225), Beneath our Feet (185), and Invent, Design, Make (182).

Although no conclusions can be drawn from the website analytics with regard to the actual rates of use of materials in classes across Scotland, it does suggest that many teachers at minimum informed themselves about the possibilities of teaching environmental themes through a variety of subjects. From the survey results, we know that 16 out of 43 of these teachers had used the support materials provided by SBT.<sup>2</sup>

Of the case study schools C and G specifically mentioned that time constraints prevented them from using the additional teaching materials. For the other case study courses, teachers used the additional teaching materials to varying degrees, and sometimes supplemented them with other online resources, by designing their own resources, or by adapting the resources offered by the Scottish Book Trust.

Examples of the cross-curricular use of these materials include:

- 1) The teacher in School D chose proactive conservation as a focus for his biology class and made use of the online teaching materials on the topic.
- 2) The teacher in School H used the information about Yosemite National Park provided by the book as an introduction to discussing concepts of wilderness and the purpose and success of national parks around the world.
- 3) The teacher in school E used the book and glossary to discuss Scots language in a geography class.

While not all teachers used these materials, those that did often found creative ways to engage with the graphic novel, highlighting different aspects and topics ranging from language to conservation.

Teachers we spoke to were positive about the book's cross-curricular nature and used it in an interdisciplinary way. One school read the graphic novel as part of their literacy in science education unit, another used it in an English class for media studies, a third used it in RE. Schools also engaged in drawing and creative writing as part of their

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<sup>2</sup> Although only 16 teachers said that they had used the support materials, more than this number answered questions about the support materials. Presumably, this indicates that more teachers looked at the materials than used them.

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work with the book. In several instances, pupils compiled a learning log or short reflective exercises about the book to help their understanding of and reflection on the graphic novel. Further details about the innovative ways in which the book and support materials are being used are included in the case studies in the appendices. However, to give you a taste of what is contained in the case studies we provide three abbreviated ones here:

#### **Case Study: School E**

The teacher of this class is the Eco-Schools coordinator for her school, which is in an urban area with multiple deprivations. John Muir is also a "big personal hero" for her. She knew the book was coming and "kept an eye out for the books to arrive". The book allowed her to develop a John Muir unit, which she had been wanting to do for some time. She used it in June as the first unit for S3 geography, structuring a 12-lesson, month-long unit around the book. Pupils read and analysed the book, engaged with the activities included at the back of the book as well as ones from the web-site and additional ones that the teacher herself developed. Halfway through the unit they visited John Muir's Birthplace Museum in Dunbar and walked a short section of the John Muir Way. The teacher emphasised that combining the book with outdoor and fieldwork activities made the experience more tangible for pupils. In addition to the environmental activities, the engaged with the book's Scots language aspect. While the class did make use of activities in the book, the teacher reported that the cost of printing prevented a more extensive use of the online resources.

#### **Case Study: School F**

This class was in a state-funded school in Dumfries and Galloway. From the teacher's perspective, the books arrived unexpectedly. However, her religious education class was already engaged in studying their own and religious perspectives on the environment, so she was able to integrate the book into this unit. The class read the book over two sessions, using it to discuss the environment, values and personal actions. They did not use any of the online resources, as the teacher was unaware of the SBT's website on the subject. The teacher plans to use it again in S1 and S2 Religious Education classes.

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**Case Study: School H**

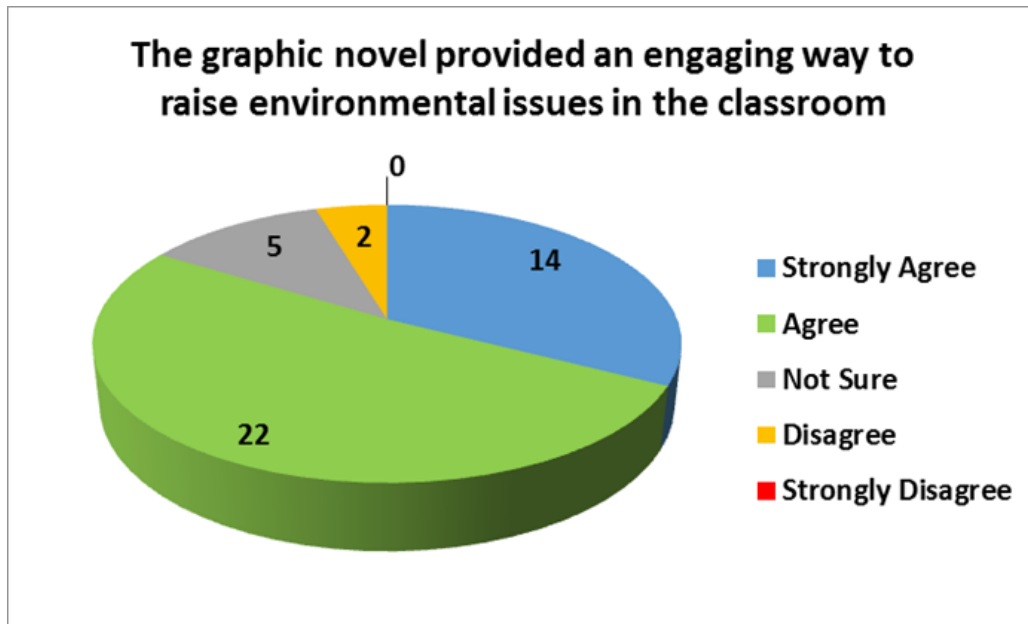
The teacher in this small state-funded school in a rural area in the Highlands and Islands was impressed by the quality of the books and support materials. The fact that they were made available to her free of charge enabled her to make maximum use of them. Teacher H found a creative and pupil-led strategy for choosing additional activities: she printed off all additional teaching resources and let pupils choose the ones they most wanted to do. She used them at the beginning of S2 geography this year, but intends to use them at the end of S1 geography in the future, structuring a three to four-week unit around them. She has actively looked for a woodland area in which to do some of the activities next year. Because of the small size of her school, classes must accommodate the full range of abilities in pupils. The book engaged all her pupils from those with autism, to those with dyslexia through to gifted pupils.

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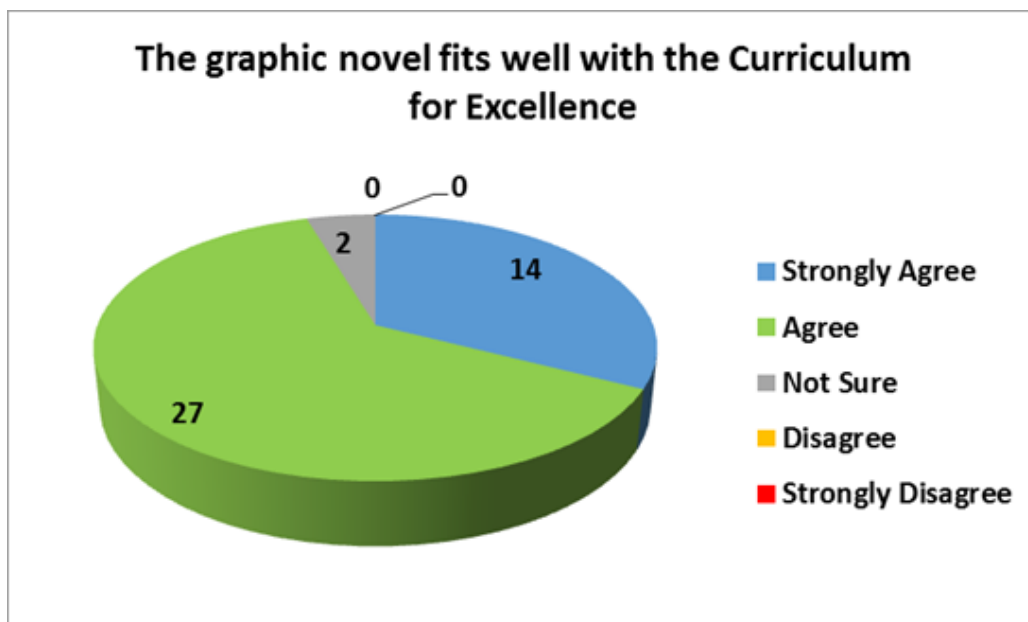
There was no clear relationship between how the book was used and the size of the mean shift observed on the INS or NEP scales. The one class that had a statistically significant mean shift in the NEP of 2.09 was an "Environment Matters Enrichment" cross-curricular class and they did engage in a number of concurrent environmental activities, including learning about environmental issues and engaging in practical actions (School B). However, one school that simply read and discussed the book (School F) had a similar mean shift to another school that structured a number of classes around the book and engaged in a range of additional environmental activities (School H). Unfortunately, we were unable to ascertain how the books were used in the other school that demonstrated statistically significant shifts in NEP and INS (School L), other than that they were used in science classes.

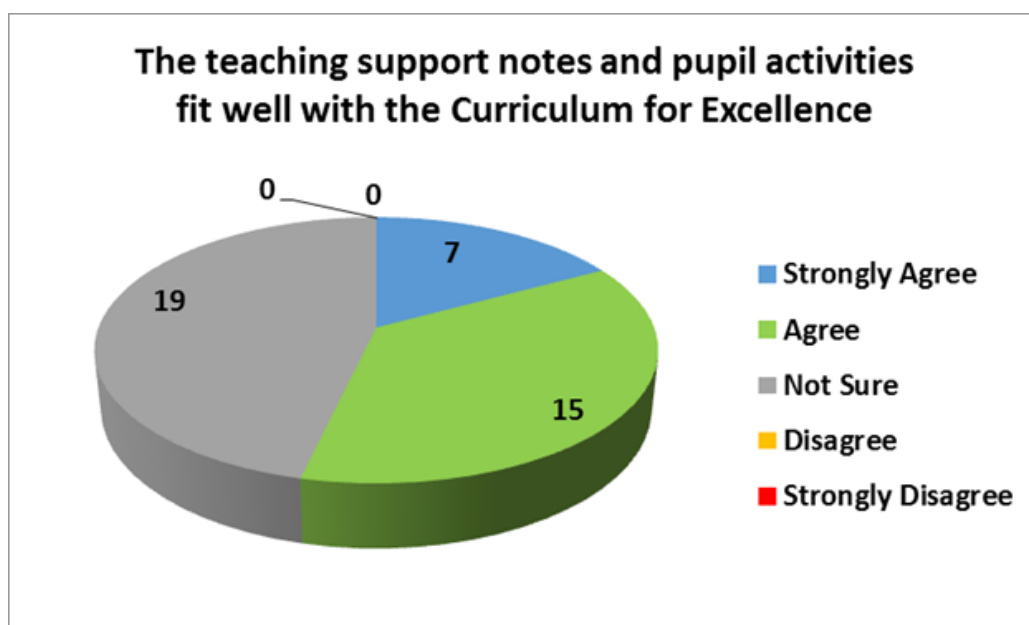
Given the ways in which the book is being used, it is not surprising that 36 teachers (out of 43) agreed or strongly agreed with the statement "the graphic novel provided an engaging way to raise environmental issues in the classroom". One teacher wrote "The graphic novel was an excellent way of engaging all our learners, even the objectionable [sic] ones." As already mentioned, the book was used in conjunction with the John Muir Award. In the words of one of the teachers: "Excellent novel and great way to teach pupils about John Muir".





Forty teachers (out of 42) agreed or strongly agreed that children in their class enjoyed reading the book. Teachers were almost unanimous in their agreement that the graphic novel works well with the Curriculum for Excellence (41 out of 43). One wrote: "I have emailed all SSMT [senior school management team] and staff about the novel and its potential in the curriculum." Twenty-two teachers felt that the support materials also work well with the Curriculum for Excellence. Since only 16 teachers said they had used the support materials, this suggests that some of the teachers who had not used them had at least read through them.





We conclude that the book engages students around environmental issues across a range of subjects, that it has been used cross-curricularly and that it works well with the Curriculum for Excellence.

The evidence from our research indicates that the book, John Muir: Earth – Planet, Universe, along with the support notes and activities contributed to the achievement of all four of SBT's desired outcomes in the schools that participated in our evaluation.

#### 4.5. Teachers Who Did Not Use the Book

Of the 62 respondents to the survey, 15, roughly one quarter, had not used the book by the end of December 2014. What can be learned from their responses?

Four were planning to use the book, but reported that they had not been able to fit it into already set lesson plans. Although some schools experience May and June, when pupils finish one grade and move up to the next, as a flexible time and were able to incorporate the book into their teaching quite quickly, other schools have less flexibility and longer planning horizons. It can take a year or more for some schools to adopt new teaching materials. It may be worthwhile for SBT to conduct another evaluation in a few years to find out just how many schools did adopt it and how many schools have continued to use it.

Three respondents had not yet used the book because they had not heard about it by the time the survey request reached their email inboxes. This was usually expressed as some variation on "our school never received the books". Delivery of the books was

tracked, therefore SBT can be certain that every school received their set. Both the books and the survey emails were sent directly to Eco-Schools coordinators. However, there seems to have been some challenges in getting the book and/or the evaluation into the hands of the correct teachers in some schools. There is no easy solution to this problem. The use of multiple pathways to communicate with schools and individual teachers might help, but probably will not completely solve this issue.

While almost all of the teachers surveyed liked the book, believed that their pupils enjoyed it and would recommend it to others, four teachers stated that they did not use the book because of issues of taste and personal judgement. One stated "This was an odd novel. The artwork was engaging but on the whole I thought the narrative was veering wildly from simple story telling to spiritually complex environmental/historical reflections." Another teacher commented that the "graphics were not attractive to pupils, and level of language too high at times for many of our target group". Conversely, a third teacher judged the book to be too childish and not pitched at an appropriate level for their students. This contrasts with the views of the teachers who did use it, 36 (out of 43) felt it was pitched at the right level for their pupils (only 2 disagreed). Nevertheless, this teacher's suggestion of using it with primary pupils could be considered for the future.

#### **4.6. Suggestions for Additional Support Materials**

We end with some further reflections and suggestions on the support materials:

- 1) Teacher H, who did not use the activities as extensively as she would have liked because of the cost of printing, suggested that SBT consider providing hardcopies of some activities in future projects.
- 2) Also in the case of school H, the support materials did not fit with the distinctive characteristics of the school's bioregion, suggesting that more locally adaptable resources might be needed.
- 3) School F used the book in RE and School G is planning on using it in that subject area as well, so some support materials for RE might be useful.
- 4) While one school successfully used the book across learning abilities, other schools did not use it because they were unsure of how to do so with pupils who have additional learning support needs. Sharing best practices with these teachers would therefore be useful.

On the other hand, both teachers using the graphic novel in School I developed their own resources and lesson plans, which they forwarded to Education Scotland for dissemination. Teacher K adapted existing teaching materials to better fit the planned

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outdoor activities for her class; these might also be useful to other teachers using the book. Establishing a learning community centred on the graphic novel might usefully enable an exchange of teaching plans and activities amongst interested teachers. This could be done as simply as collecting and sharing materials on the SBT website, or it could involve creating a learning and teaching community online using social media.

#### **4.7. Limitations of the Evaluation**

Only 62 schools responded to the teacher survey out of 578 schools that received the book. Equally, just 12 schools of the 100 that were asked to participate in the pupil attitude survey managed to fill out and return sets of before and after questionnaires during the timeline of this evaluation (5 others completed the first set of questionnaires but not the second). These low response rates impact on the generalizability of the findings of this evaluation.

Feedback from a few of the schools which we approached but which did not choose to participate indicates several possible reasons for the low response rates:

- The timing of the evaluation was too soon for some schools, who were not planning on using the book until spring 2015 because of the need for advanced planning for their lesson delivery;
- The timing of the evaluation was too late for some other schools, where the teachers who had used the book had already moved on by the time of the evaluation;
- There were also challenges in reaching the relevant teacher within some schools as discussed in section 4.5 above.

Because of the low response rate and the feedback indicating that there may be specific characteristics of schools that did not participate, we cannot assume that those who did fill out the survey are necessarily representative of all teachers in Scotland.

## Chapter 5: Summary and Conclusions

This evaluation has demonstrated that the graphic novel project John Muir: Earth -- Planet, Universe contributed to meeting SBT's four desired outcomes in the schools that participated in this evaluation. Because of the low response rates to the teacher survey, we cannot comment on the extent to which the books were used across Scotland. However, the attitude survey did include pupils from every region of Scotland, from state-funded and private schools as well as from a diversity of demographic backgrounds, which does allow us to say that engaging with the book alongside other activities is likely to meet SBT's desired outcomes across the full range of schools in Scotland.

John, Muir, Earth -- Planet, Universe has been effectively used alongside other environmental activities to shift students attitudes and values towards the natural world. To the best of our knowledge, this evaluation is the first study to demonstrate a shift in attitudes towards and connection to the natural world related to reading a book. This finding supports the use of books as facilitators of individual and social change.

The books and support materials are already being used in a range of subject areas and cross-curricularly. The teachers who participated in this evaluation overwhelmingly reported that it worked well with the Curriculum for Excellence, that they intended to use it again and that they would recommend it to colleagues. Teachers who used the resources valued those as well.

Reading John Muir: Earth -- Planet, Universe alongside other activities can raise awareness, connect pupils more strongly to nature and shift their attitudes, values and identities in ways known to be related to responsible behaviour around enjoying, respecting and preserving our natural environment and engaging in protecting and restoring wild places.

# Appendices

## A Environmental Attitudes Survey

The University of Edinburgh and the Scottish Book Trust want to learn more about what secondary school pupils in Scotland think about environmental issues and how this thinking changes over time. We need your help.

Please answer the questions below, ticking the circle that matches what you think. When you are done, fold the questionnaire in half. Your teacher will collect the questionnaires, put them in an envelope and mail them to the University. We will remove names and give questionnaires codes so that no one but the researcher can tell who filled in which questionnaire.

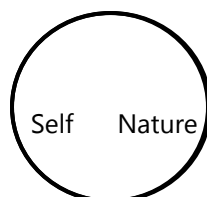
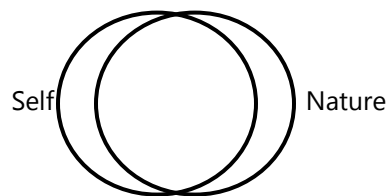
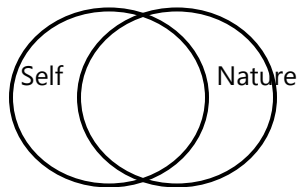
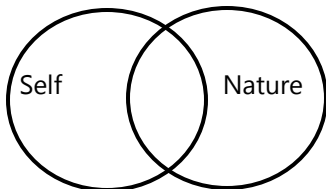
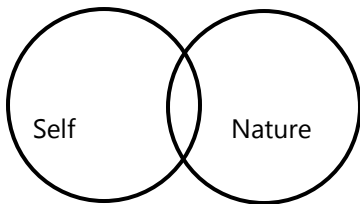
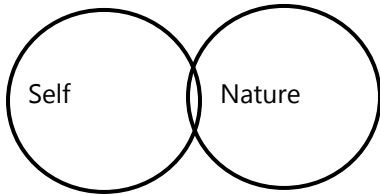
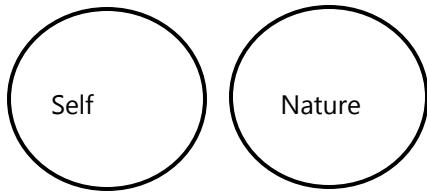
You will be asked to answer the same questions again in the future so we can see if your thinking has changed over time. The same questions have been asked in schools in other countries, so we will be able to compare what Scottish pupils think to pupils elsewhere.

We really hope you will help us with our research. However, if you do not wish to participate, you do not have to, simply leave the questionnaire blank.

Thank you very much for your help.

	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
1) Plants and animals have as much right as people to live	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2) There are too many (or almost too many) people on earth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3) People are clever enough to keep from ruining the earth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4) People must still obey the laws of nature	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5) When people mess with nature it has bad results	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6) Nature is strong enough to handle the bad effects of our modern lifestyle	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7) People are supposed to rule over the rest of nature	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8) People are treating nature badly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9) People will someday know enough about how nature works to be able to control it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10) If things don't change, we will have a big disaster in the environment soon.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

11) Please circle the picture below which best describes the relationship with the nature environment.  
How interconnected are you with nature?



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## B General teacher questionnaire

### John Muir Graphic Novel Evaluation Questionnaire

In April you received a classroom set of graphic novels depicting Scottish-born environmentalist John Muir's life. This graphic novel was produced by the Scottish Book Trust with the input of secondary school students. The University of Edinburgh is evaluating this project on behalf of the Scottish Book Trust. We would appreciate your help with this evaluation. Please answer the following questions. Answers will be kept confidential and no school names will be used in reports or publications.

Please return the completed form in the stamped envelope provided or, alternatively, you can fill out the questionnaire on-line at [www.johnmuirevaluation.wordpress.com](http://www.johnmuirevaluation.wordpress.com)

School:

Did you use the graphic novel with your pupils? YES / NO

If you answered "NO", briefly outline the reasons why.

If you answered "YES", briefly describe the way the graphic novel was used.

Did you engage with any of the supporting activities? YES / NO

If yes, which one did you find to be the most useful and why?

Did your class engage in any other environmental education projects during this same period of time? YES / NO

If yes, briefly describe these activities.



Please tick one box for each statement:

	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
Children in my class enjoyed reading the John Muir graphic novel					
The graphic novel was pitched at an appropriate level for my pupils					
The graphic novel fits well with the Curriculum for Excellence					
The graphic novel provided an engaging way to raise environmental issues in the classroom					
The graphic novel increased pupil's awareness of the value of the natural world					
Engaging with the graphic novel led to a noticeable increase in pupils exhibiting environmental behaviours such as recycling, composting and picking up litter					
The teaching support notes and pupil activities linked well with the graphic novel					
The teaching support notes and pupil activities were pitched at an appropriate level for my pupils					
The teaching support notes and pupil activities fit well with the Curriculum for Excellence					
The graphic novel, support notes and activities impacted on pupils' sense of connection with the natural world					
The graphic novel, support notes and activities impacted on pupils' sense of connection to the place where they live					
I would use the graphic novel again with a class					
I would use the teaching support notes and pupil activities again with a class					
I would recommend the graphic novel to other teachers					
I would recommend the teaching support notes and pupil activities to other teachers					

Please provide any comments related to the answers given above:

In order to learn from best practices, we would like to talk to a sample of teachers who have successfully used the graphic novel. Responses will be kept anonymous and confidential. If you would be willing to talk to us, please provide the following information:

Name:

Email address:

Telephone number:

If you have any questions or comments about this questionnaire and/or our evaluation research please contact myself or the chair of our ethics committee (see below for contact information)

Many thanks,

Alette Willis

## School Case Studies

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## Case Study A

The state-funded secondary school with a roll of 1300 is located in a small town in the Scottish Central Belt. Its catchment area, which covers several small towns, shows a pattern of mixed wealth and educational attainment. While part of the catchment area reaches wealth and education levels that lie above the Scottish average, one of the towns within the catchment area is characterised by multiple deprivations, including high levels of unemployment. Moreover, a significant percentage of the catchment area lies within the Scottish average for both education and wealth.

The area is characterised by an abundance of detached and semi-detached housing, with small to medium-sized gardens providing a measure of green space. Moreover, both the shore and open fields are nearby. The school is an Eco-School and commands some green space.

The book was used with a S2 English class during the month of May. Due to a teacher form missing, not a lot of information could be gathered. However, it appears that the class completed the before- and after-surveys on the same day, having read the graphic novel in class.

### Case study B

This state-funded secondary school is situated in a small town with a significant commuter population. The school roll is approximately 1000, and pupils come both from the town itself as well as from the surrounding small towns and villages. The school is an Eco-School with some green space within its grounds. The surrounding area is rural, and most dwellings within the catchment area are detached or semi-detached houses with a garden. The catchment area is relatively affluent and education levels likewise range slightly above the Scottish average.

The group of pupils who read the book were a class of S1 pupils doing the 'Environment Matters Enrichment' course (cross-curricular, but taught within Geography / Humanities). The pupils read the book near the beginning of the course, as part of a lesson. Towards the end of the course they completed the second evaluation sheet after a discussion with the teacher. During the course, besides engaging with the book, they looked at DVDs about moorland, Antarctica, Climate Change. They did activities in class on Antarctic / Arctic animals, moorland food webs, Global and Carbon Footprints, packaging and waste. They also did practical activities: litter picking, collecting paper for recycling across the school, leaf clearing and composting.

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## Case Study C

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The school is an independent private day school located in a large Scottish city. It offers both primary and secondary education and has a combined roll of approximately 1500. The school is an Eco-School and currently holds four Green Flags. Its commitment to green issues is also reflected in the fact that it has consistently been a Green Flag holder since 2007. The school commands large school grounds with ample green space.

Due to the school's nature as a private school, no catchment data is available. While the school provides some scholarships, it can be assumed that most pupils come from relatively affluent backgrounds. Since the school requires entry assessments, pupils' academic performance presumably is above average.

The graphic novel was used with a S2 class for two weeks in late May. Students read the graphic novel individually in class. Due to time constraints, none of the additional teaching resources were used. However, the class engaged with a number of environmental activities outside the classroom, including a competition with nPower on renewable energy.

The teacher was unsure about the book's impact on environmental behaviours, but thought that it enhanced pupils' sense of connection to the place they live, as well as raising awareness of the value of the natural world. Overall, the teacher was very positive about the book. She noted that the support notes linked well to the Curriculum for Excellence and were pitched at the appropriate level. The teacher, who also is the Eco-School Coordinator, has emailed all SSMT and staff about the novel's potential in the curriculum.

## Case Study D

This state-funded school serves about 500 pupils and is located in a small town in the Scottish Highlands. The school's catchment area covers the town itself as well as the surrounding villages and wider countryside. The area ranges within the Scottish average for educational attainment and has lower-than-average levels of income and employment. The school is an Eco-School. Given the school's location, access to green space is judged to be very good.

The book was used with an S3 biology class. After-surveys were returned in late May, but no indication was given as to when the class used the book or when the pre-survey was completed.

Students were each given a copy of the book to read in class and take home. The class engaged in a group activity on proactive conservation, using the online teaching resource 'The Wild Man Who Changed the World – Proactive Conservation' provided by the SBT website. The teacher also used a two-part YouTube documentary on John Muir. No other environmental activities were engaged in with this class.

The teacher indicated that pupils enjoyed reading the novel and that it fits well with the Curriculum for Excellence. She was also positive in her evaluation of the teaching support notes and pupil activities, but unsure whether the graphic novel increased either pupils' environmental behaviour or their awareness of the natural world's value.

The book and additional materials were only used to a limited extent by this teacher because they did not fit in with the current topics covered in class. The teacher hopes to use the materials provided from June through to November with the new S3 cohort.

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## Case Study E

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This state-funded school has an enrolment of just a few hundred pupils, all of whom live within walking distance. The school lies at the edge of a city in an area of multiple deprivations, with wealth, health and educational levels all being lower than average for Scotland. Pupils mostly come from the "lower end of the socio-economic bracket" and 20% of them are newcomers to Scotland, with backgrounds ranging from refugees to university lecturers' children. The school is an Eco-School and the participating teacher is one of the Eco-School coordinators. The teacher characterises the community as a "very urban setting" but relatively close to parkland.

The teacher kept the preliminary flyer for the graphic novel and was actively looking out for the class set to arrive. Using the book was the first thing that she did with her S3 geography class when they began their school year in June. Pre-surveys were completed immediately before the book was used and post-surveys were completed four weeks later when work with the book finished. While some of the pupils had an existing interest in outdoors and the environment, and had participated in the John Muir Award, others had no such background and no prior knowledge of John Muir. The book and additional activities worked well with the more flexible approach of the Curriculum for Excellence and the more fun and relaxed learning activities that can be used in the month prior to summer holidays.

John Muir is a "big hero" of the teacher and someone she thinks more people in Scotland should know about. The graphic novel and teaching resources enabled her to introduce John Muir into the classroom for the first time. During a month-long John Muir unit involving 12 lessons, pupils read the book together, analysed and discussed it. The teacher drew on the additional teaching materials in the back of the book, particularly the Scot's language glossary and the chronology, and the online resources provided by the SBT website. Students also watched a documentary about the life of John Muir. According to the teacher, pupils responded well to the book, enjoyed the pictures and the Scots language. On the latter point, she believes that the Scots language in the book resonates with what many pupils hear at home and in the community. She felt that looking back on a simpler life was appealing but that pupils today could still relate to him, especially to the fun person he was in his childhood. The teacher herself was especially positive about the accessibility of both the book and John Muir's life story. She hopes that these students will remember John Muir and what he stood for. For her, that would be enough.

This teacher actively encourages pupils to engage with their local environment and is active with the Duke of Edinburgh awards at her school. Halfway through reading the book, she took her geography class to Dunbar, visiting the John Muir Birthplace

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Museum and walking the first two miles of the John Muir Way. This was partly enabled by having a small class. The trip made it "much more real". The teacher stressed the importance of deepening classroom learning with real-life, tangible "fieldwork" experiences. Few of the pupils at this school would be taken on excursions by their parents, making such experiences especially meaningful to these children. She notes that John Muir's philosophy emphasises the importance of "fieldwork".

The teacher plans to offer a John Muir unit again next year

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## Case Study F

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This state secondary school serves a town and surrounding rural area in Dumfries and Galloway. It is an Eco-School. They know about the John Muir Award, but do not yet participate in it, although they hope to do so in the next few years. At this school, the John Muir graphic novel was used in Religious Education by a teacher who mainly teaches geography.

At this school, RE class is held once a week. They were in the midst of learning about different religious perspectives on the environment and on how the pupils themselves relate to the environment, when the book arrived unexpectedly. The teacher felt that John Muir's story fit well with these topics and with the RE focus in S1 and S2 on the environment, values and personal actions.

The pupils read the book over two classes. No additional activities were engaged in. The teacher was not aware of the resources available on the Scottish Book Trust website. The questionnaires were filled out by pupils in the class the week before and the week after the weeks in which they read the book.

This teacher recently met with some of the pupils who had been in that RE class. They remembered the book, particularly the pictures, which they enjoyed. Some pupils reported that they felt the language was a little childish. The teacher thought it could be because they were unused to having serious content conveyed through comics.

She plans to use the book again with another RE class.

## Case Study G

The school is a state-funded combined primary and secondary school located on one of the Scottish islands and has a roll of less than 100 pupils. Its catchment area is remote and rural and covers a fairly large land area of more than a dozen small communities. Figures for wealth and education range slightly below the Scottish average. Access to green space is plentiful, with the shore, the open countryside and some more wild and remote land nearby. The school grounds themselves provide lawn only.

The book was used by the S1 and S2 English classes during two weeks in May. By way of introduction, pupils researched the John Muir Trust on the internet, then read the graphic novel in class. It is unclear whether and how the class engaged with any of the additional materials. The teacher indicated yes in the questionnaire, but wrote that time pressure with other curriculum areas meant that activities might be revisited as homework tasks. The class did not carry out any other environmental activities.

The teacher was unsure whether the book provided an engaging way to raise environmental issues or increased pupil's sense of connection with the natural world. He was also unsure whether the book impacted on pupils' environmental behaviours or awareness of the natural world. While he was positive about using the book again himself, he was unsure about recommending it to others. In this teacher's estimation, cross-curricular work with Religious and Moral Education might be useful for discussion groups.

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## Case Study H

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This small state-funded Secondary School (under 200 pupils), based in a town in the Highlands and Islands, does not participate in the EcoSchools programme. It was the Principal Teacher who received the book and passed it on to one of the geography teachers.

The geography teacher was impressed by the quality of the books, stating that her school couldn't have afforded them if they had not been free. She particularly liked the cross-curricular nature of the book, covering history, geography, science and technology. She made good use of the activities, noting that they were also free. Because the books were received late in the school year, it was expedient to use them with her S2 class. However, in the future, she plans to use it at the end of S1, in a similar way to what is described below, structuring an entire 3 to 4 week module around it. She has already scoped out a nearby woodland for some of the activities next year. Overall, she sees the book as an engaging means of covering the "recycling and environment" part of the curriculum.

She had her S2 pupils fill out the pre-questionnaire the class before she handed out the books (2 to 3 days before). She then had her pupils read through the book themselves. She downloaded and printed out all the support materials from the website and placed them on a table at the front of the class. Pupils then re-read the book and chose activities to do. She felt all the support materials were excellent, except the ones that specified a type of flora and fauna that is not common in their bioregion. She thought these could have been made more inclusive. In addition to the resources provided by the Scottish Book Trust, she had the class engage in other activities, such as finding Yosemite in an atlas, and following the John Muir Way on the computer to figure out what people walking along it would see. In this way, the book served as a jumping off point for teaching the pupils a wide range of skills.

The School and class are mixed socioeconomically and in their learning abilities. The teacher was impressed at the range of abilities and learning accommodated by the graphic novel genre. Her autistic pupil, who has difficulty reading, was able to glean information from the illustrations. The book was also helpful for pupils with challenges reading long passages, such as those with dyslexia. On the other end of the spectrum, she asked one of her gifted pupils, who finished the book quickly, to pick a page and write a story about it: what was the character doing? thinking? The class worked with the book and activities for 3 or 4 weeks and then completed the post-questionnaire.

This teacher also used the books briefly with an S4 class in relation to a discussion about Scottish national parks. She used the bit of the graphic novel at the back that discusses Yosemite to illustrate that national parks are organised differently in

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different parts of the world. This enabled the class to critically discuss wilderness, the purpose of national parks and whether parks achieve their purposes.

In terms of the long-term impacts of the book, this teacher reported that one of the pupils, who had used the book last year, chose Dunbar for a geography project specifically because that was where John Muir came from. In general, she thinks pupils remember Muir's dog, his brother and that he moved from Scotland to America when he was a child. During the reading of the book, pupils asked lots of questions about why Muir's family moved to America instead of Australia and New Zealand (contextualising the story in earlier lessons around migration) or Canada (relating the story to a pupil's Canadian parent). They also wanted to know what happened to the members of the Muir family who did not leave Scotland.

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## Case study I

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This state-funded secondary school has a roll of about 1200 pupils and is located in a large urban centre. The catchment area stretches across a dense urban setting with a high percentage of tenement housing and very few terraced or semi-detached houses. More than one large recreational park lies within walking distance of the school. The school is an Eco-School and has a Green Flag.

The school's neighbourhood is an area of mixed wealth with levels ranging from average to higher-than-average levels of deprivation. Educational attainment within the area likewise ranges from average to below-average. In terms of examination results and leavers' destinations, the school performs well above the Scottish average.

The book was used by two members of staff across two different S1 classes for three weeks in May. Both teachers developed a substantial unit around the graphic novel. One class used the books to study the work of John Muir, while the other group examined the book from a media point of view. The units and pupils' work were forwarded to Education Scotland by the Principal Teacher of Attainment and Achievement as a guidance tool for other schools. However, the teacher is not sure whether, or in what way, Education Scotland has used these resources. [We were unable to discover this either.]

Of the two classes that used the book, the questionnaire was filled in by a S1 English class during the month of May. The teacher created her own set of resources for the purpose and therefore did not have any comments on the teaching support notes and pupil activities. Prior to reading the novel, pupils studied the graphic novel genre. They then read the graphic novel, compiling a learning log throughout. Finally, pupils completed a short personal reflective activity. As part of the S1 John Muir award, the class moreover participated in an out-of-school conservation activity.

This teacher indicated that pupils in her class enjoyed the John Muir graphic novel and that it presented an engaging way of raising environmental issues in the class room. It was pitched at an appropriate level and fit well with the Curriculum for Excellence. The teacher was also positive that the novel increased pupils' awareness of the value of the natural world, but unsure whether the novel impacted on pupils' environmental behaviours.

The teacher now works at another school, but has indicated that she would use the book again with a class, and would recommend it to other teachers. Indeed, the school is planning to use the book again this spring during their John Muir fortnight.

## Case Study J

The EcoSchools coordinator received and used the book with her environmentally-oriented S2 enrichment class, which is centered around the John Muir Award. All pupils on the course have opted to take it and already have a generally high interest in environmental issues when they begin. The teacher has used John Muir's life story as the introduction for this course for the past 6 years, so the graphic novel fit perfectly into an already existing class plan.

The teacher used the pre-questionnaire as the first activity in the course. Pupils were asked to read the graphic novel for homework, but many had not completed it, so were given time to read it in class the following day. The teacher developed questions for each chapter of the graphic novel for pupils to reflect on and discuss. Pupils completed the post-questionnaire shortly after reading the book in class.

The time-line was particularly useful to pupils, who drew on the book and time-line in creating posters about John Muir's life. Most of these posters concentrated on the things John Muir did in the U.S.A.

Many weeks after reading the book and completing the post-questionnaire, these pupils went on a long distance walk along part of the John Muir Way. They will be making presentations about this journey as the "share" part of the award.

This state-funded school in a middle-class area of a city has an enrollment of over 1000 pupils. The school has consistently been awarded a green flag over the last half dozen years.

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### Case study K

This state-funded, combined primary and secondary school has a roll of just a few hundred pupils and is located in one of the Scottish islands. Its catchment area covers several small to medium-sized communities in a generally remote and rural area. In terms of wealth and education, the area ranges within the Scottish average. Access to green space is plentiful.

The book was used during the month of May with an S1 class as part of the John Muir Award. Pupils read the book prior to their Explorer Day out. The class did not engage in any other environmental activities. The teacher amended the additional teaching materials to fit around the planned outdoor activities. He was unsure whether he would recommend or use the teaching support materials again.

The teacher was positive about pupils' enjoyment of the graphic novel and saw it as an engaging way to raise environmental issues in the class room. According to this teacher, the book had a positive impact on pupils' sense of connection with the place they live, but he was unsure whether it had an impact on students' awareness of or sense of connection with the natural world. The teacher highlighted a good fit with the Curriculum for Excellence, but was unsure whether the book was pitched at an appropriate level for his class. He was also unsure about any noticeable increase in environmental behaviours.

### Case study L

Unfortunately, the pupil attitudes survey was returned from this school with very little accompanying information. All that we know is that the book was used with four S1 science classes.



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